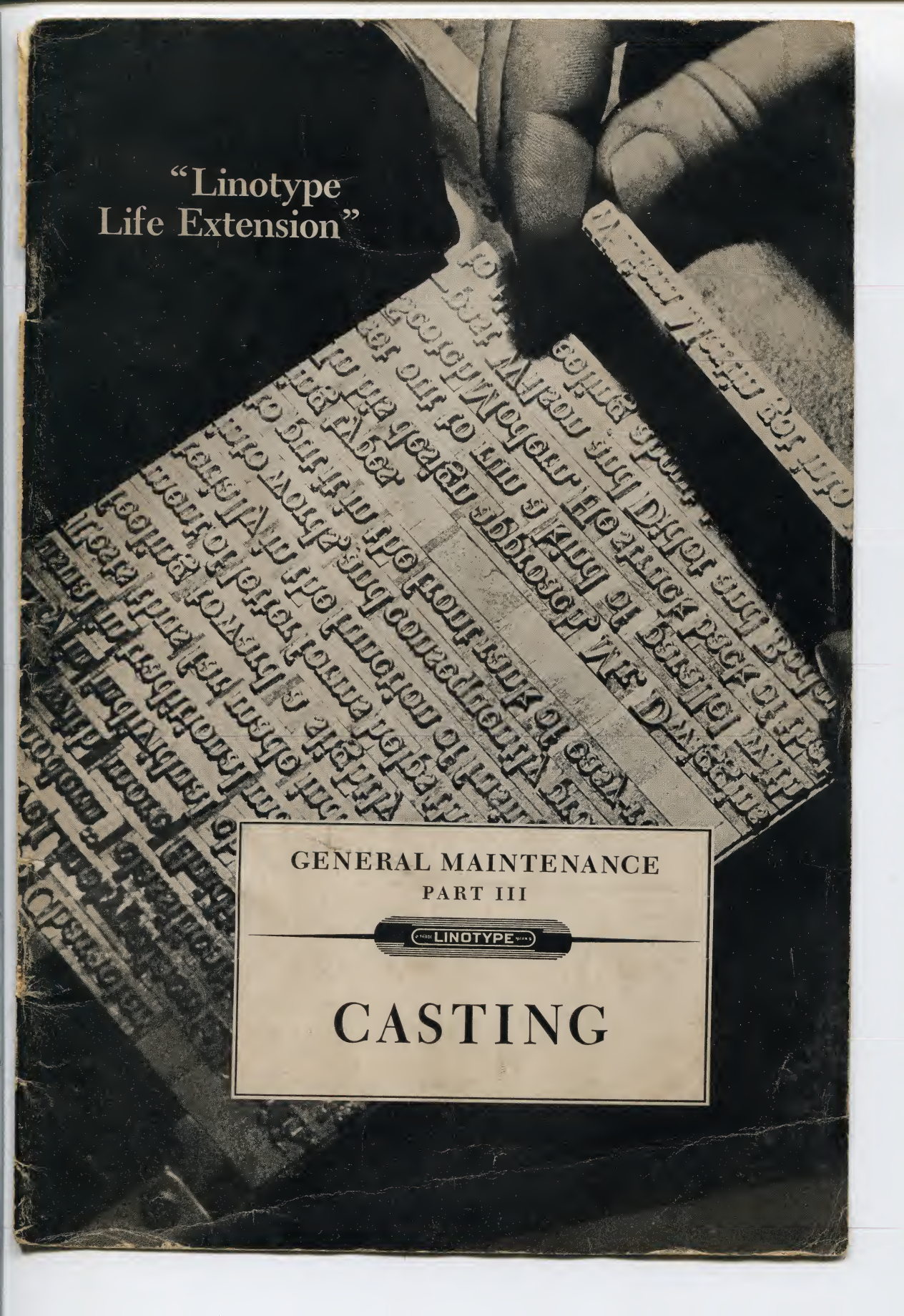

GENERAL MAINTENANCE

PART III

LINOTYPE

CASTING

GENERAL MAINTENANCE · PART III

CASTING

For more than half a century, LINOTYPE has maintained a policy of sharing the technical experience of engineers, plant machinists, and operators with Linotype users everywhere. The *Linotype Life Extension* series of booklets, of which this is one, has been compiled and distributed in the interest of maximum production with minimum waste and delay, through continuous operation.

LINOTYPE, BROOKLYN, NEW YORK
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CANADIAN LINOTYPE, LIMITED, TORONTO, CANADA

The following helpful hints are intended to assist Linotype users in diagnosing troublesome conditions if they develop. They represent the best judgment of Linotype technical experts from here, there and everywhere although no pretense is made that in some cases there may not be other remedies. Nor are these brief comments to be considered as comprehensive discussions of the mechanics or maintenance of Linotypes. Competent Linotype machinists devote lifetimes to studying and developing newer and better methods of maintenance, frequently with consequent improvement in production, both in quantity and quality. These general topics have been taken from the book *"Linotype Machine Principles,"* the official Linotype manual ($3.50 postpaid U. S. A.).

"Carelessness does more harm than a want of knowledge."

—BENJAMIN FRANKLIN

CASTING

First Elevator Slide and Jaw

Keep the sides of the elevator slide free from gum and oil them occasionally.

The adjustment for height, to line with the delivery channel, is made by screw in first elevator auxiliary lever, also by turning the barrel of the link at the bottom of the slide. The adjustment to square the elevator jaw is made by four gibs, two upper and two lower. Adjust for height to line with transfer channel by screw on lower right side of slide.

If the face of the type has a poor alignment, examine the matrix adjusting bar and the duplex rail. If worn, replace.

If matrices fall off the line as the first elevator descends to the casting position, examine the matrix retaining pawls. They may be broken, worn, or too weak. If the movement of the line delivery slide is sluggish, the automatic starting pawl may be tripped off before the line is fully in place.

When replacing first elevator back jaw, be sure it is square with the front jaw; otherwise the matrix retaining pawl will not be in correct position, or end of jaw may strike intermediate channel when elevator is rising.

If a matrix falls off the right-hand of the elevator jaw after it leaves the vise jaws it may be due to a broken or worn matrix retaining pawl. If the trouble persists, shut off the machine just as the elevator leaves the vise jaws, and see if the end matrix is held in place, or if it comes against the extended face of the pawl. If found to be in the latter position, the simplest way to correct the trouble is to remove the back pawl and replace it with a slotted one (same as front pawl) and slide it as far as possible to the right, just so it will not bind, and then slide the front pawl out slightly to correspond.

If the line of matrices fails to seat properly between the vise jaws, it may be that the line is too full, or a matrix may have fallen out of the line and be resting on top of the vise cap in such a way as to prevent the line from seating. It is also possible that the back jaw of the first elevator has become bent in such a way as to bind on the vise jaw. A line of matrices that is too tight between the vise jaws must never be forced down, as this practice is apt to

damage the lugs of the matrices. It is always best to raise the first elevator jaw by hand and remove enough matrices to free the line.

On the later model Linotypes the knife wiper is operated from the first elevator slide, and at the top of the slide there is an adjustable plunger which is used to maintain a uniform stroke of the wiper regardless of the thickness of the slug being cast. If this plunger is incorrectly set it will not allow the first elevator to seat properly.

The adjustment to bring the lugs of the matrices to align with the mold groove is made with the center screw in the top of the first elevator slide. The other screw is for adjusting the vise automatic vertical lever so that the mold slide cannot come forward until the center screw rests on the vise cap. If this adjustment is not correct the lugs of the matrices are apt to be sheared off if a tight line is sent in.

How to Remove a Squirt—If the squirt takes place in such a manner that the metal holds the first elevator down tight on the vise cap, do not attempt to open the vise until you have first removed the back jaw support. Then remove the wing-pin from the bottom of the connecting link where it is fastened to the first elevator lever. After this is done remove the two screws at the left-hand end of the elevator jaw, then turn the vise locking screws to the open position, and press the jaw apart. At the same time allow the vise to open to the first position, and then pry the line of matrices from the front jaw.

After this is done it usually happens that a long strip of metal has formed between the duplex rail and the matrix adjusting bar and this must be driven out, but do not use a steel tool for this purpose, as the jaw might be damaged. Use a piece of brass, or even a six-point Linotype slug will usually remove it.

After all metal has been removed, try the duplex rail and see that it works freely, and has not been bent. If the rail should bind, it is possible a small piece of metal may be between the duplex rail and the jaw, and it will then be necessary to remove the bottom plate, which is held to the jaw with five screws.

The front jaw is held to the elevator slide with two three-eighths screws and a key to hold it in alignment, and if it becomes necessary to remove it, make a small scratch from the jaw to the elevator head, as it is possible to get a slight variation when replacing, as there are no dowels.

Before replacing the back jaw, take care to see that the lower edge is in exact alignment with the top, using a straight edge, or the edge of a spaceband.

When replacing the back jaw, be sure the two jaws and separating blocks are exactly even at the ends. The long screw goes at the left end, and the shorter one is made to clear the safety plate on the back jaw.

After the elevator jaw has been assembled, try a matrix between the jaws, and see that it slides freely the entire length (30 picas) in both the lower and

upper positions, and also check distance between jaws, to make sure there is not too much clearance. Also try a spaceband in the grooves to see that there is no obstruction.

It is always the safest plan to remove the back jaw on any kind of squirt, as this will leave the front jaw open to inspect for any particles of remaining metal.

When a squirt has been removed from the elevator jaw, examine the left-hand vise jaw to see that it slides freely. It is possible that some metal particles might make it bind.

Principal Causes of Squirts—(1) The vise automatic not properly set to throw out the clutch and stop the machine if the first elevator does not seat on the vise cap, which may be caused by some obstruction, or an "overset" line, too wide to go between the vise jaws.

The failure of the automatic to operate may be due to a broken spring in the vise automatic mold disk stop dog, or the spring may be too weak, or clogged with metal.

(2) On machines where the simple two-letter attachment, or "flap" as it is sometimes called, is used, and the machine is not equipped with the auxiliary line safety device, and the "flap" is thrown in place to hold the elevator slide in the raised position, and the line is assembled with matrices on the upper rail, it will cause a squirt for the reason that the line of matrices will be doubly raised and the lugs will be too high to enter the mold groove.

(3) As every line set varies in width, the long finger on the line delivery slide must immediately "take up," or in other words, when the line of matrices starts across, the finger must not start over until the matrices have come against it, and it must stay against them until the line has been transferred to the elevator jaw.

If the long finger does not have this "take up" and the line is sent in just about the time the machine comes to normal position, the matrices are likely to twist sideways, and leave an open space for metal to come through if the line is widely spaced (not full).

(4) Failure of mold disk slide to come ahead far enough to catch the lugs of the matrices. This could be caused by the eccentric screw which controls the slide, working loose.

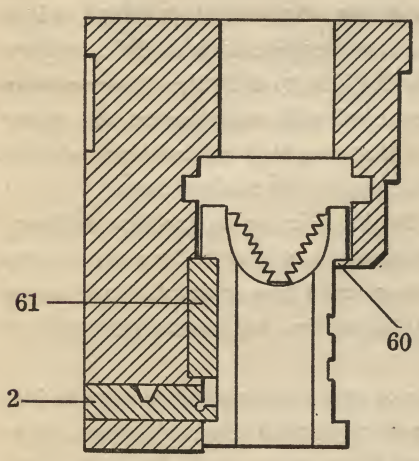
(5) Particular care should be given to the pot pump stop. The lever which controls this reaches to the end of the right-hand vise jaw, and has an adjusting screw which rests against the jaw and should be adjusted so the stop will just clear the block on the plunger lever, when the line is fully justified. Too much clearance will allow a line that is not quite full to cast, and will possibly show hairlines. (See "Automatic Pump Stop" on page 24.)

The spring on the pump stop should have sufficient strength to hold the stop under the plunger lever block in case a *very* short line is sent in as this creates a slight pressure on the right-hand jaw when the justification levers operate, so the spring on the pump stop must be strong enough to overcome this pressure.

Sometimes a slight splash of metal gets under the stop and makes it bind; also on some old machines the plunger lever block comes below the stop so it cannot drop under. Usually this is caused by wear on the pot pump lever cam, a worn cam roll, or roll pin.

First Elevator Jaws—The matrix retaining pawls should both have the same amount of tension; this will make a smoother action as the line of matrices enters the elevator jaw, and will be of help when the line of matrices is transferred to the second elevator.

As shown in the illustration just below, the distance between *60* and *61* must be as close as possible without binding the matrix on the sides.



Cross-section of first elevator jaws. 60 is the lower ledge of the first elevator back jaw; 61 is the matrix adjusting bar on the front jaw; 2 is the duplex rail.

When the line of matrices goes down in the vise jaws, there is a slight side pressure on the end matrix on the right-hand side, as it comes in contact with the vise jaw, due to pressure of the pot pump stop spring which moves the jaw slightly to the left, and if the matrix fits too loosely between *60* and *61*, the lower front lug of the matrix is apt to slide out from under the duplex rail, and raise up enough to cause the lower back lug to be sheared off when the mold advances. This is especially true when the line is fully spaced out.

The diagram shows the top lug of the matrix resting on the matrix adjusting bar *61* and the lower lug under the duplex rail, and this should be a close fit.

If alignment is poor, examine the top of the matrix adjusting bar, and if wear shows at this point, replace it. Or remove the bar, which is held to the front elevator jaw with five screws, and reverse it by turning it inside out. But be sure to taper the edges before replacing it so the matrices will not bind as they enter the elevator jaw. Also examine the under part of the duplex rail for any undue wear at that point.

When the matrices are in the raised position in the elevator jaws, the alignment is held in place by the bottom lug only, and if that part is worn too much, it will be difficult to get a good alignment.

The duplex rail *2* should be examined occasionally to make sure it does not travel too far ahead.

On all late model machines the duplex rail has a small block fastened at each end to control the forward movement of the rail, and these blocks replace the pins which were formerly used for this purpose. The blocks provide a sturdy banking surface and should last indefinitely.

On the older model machines the duplex rail is made with two pins on its lower surface, and these slide in grooves cut in the lower cap, the pins acting as a stop when the springs force it forward.

The duplex rail should be in exact line with face of the matrix adjusting bar. If the stop pins mentioned above should become worn, the rail may come too far forward; and if so, it can be brought back to the proper position by replacing the worn pins with new ones.

Line Stop—On all late-model machines the line stop is automatically carried to the right each time a line is transferred to the second elevator.

The tension should be heavy enough to hold the matrices in place, and weak enough so it will not retard a line of matrices when entering the first elevator jaws. Its tension may be increased by widening the open end gap.

The most important function of the line stop is to prevent the matrices from spreading when recasting, and if the matrices are in the raised position in the elevator jaws, to keep the end matrix from falling sideways to the left when the elevator slide is on its upward movement.

First Elevator Slide Safety Stop Plate—When using head-letter molds, see that the elevator jaw has a safety stop plate and that there is a stop block at the end of the mold. This safety device throws out the clutch if the "flap" is not thrown into position. Otherwise the line of matrices will be in the lower position in the elevator jaws and the advancing mold will strike the back jaw.

Elevator Slide—The elevator slide should be oiled occasionally on the sides where it travels between the gibs. The slide must work freely so its position will be correct to receive the incoming line of matrices. This setting should be slightly below the delivery channel.

The only other part of the elevator slide that needs oil will be the two levers that operate the duplex rail. A small amount of oil rubbed on with the finger tip will be sufficient. Also oil the pins at the ends of the connecting link.

The Vise

When the machine is in normal position the vise may be lowered until it rests against the stop pin, and when in this position the mold slide may be pulled forward part way after disconnecting the ejector lever link and locking the mold cam lever handle down. This will allow ample room for inspecting the pot mouthpiece or the back knife.

If it becomes necessary to open the vise to the second position, turn the machine forward until the first elevator slide rests on the vise cap and stop the machine before the mold slide moves forward. Open the vise to its first position, withdraw the stop pin and lower the vise until the frame again rests on the stop pin which must be back to its normal position. With the machine in this position there will be no strain on the first elevator lever. The vise must never be lowered to either position if the justification levers are raised, or when the machine is near the casting position.

The mold slide can be removed while the vise is open to the second position by locking the mold cam lever handle down and disconnecting the ejector lever link, the ejector blade controller and the water hose.

Vise Automatic

Setting the Vise Automatic—First check the center screw in the elevator head to be sure the matrix lugs have the proper .010″ clearance (.005″ clearance, if Linotype is equipped with a two-letter display mold) in the mold groove, then put the machine in normal position.

Pull out the plunger rod pin for safety, shut off power, and with starting lever out, trip the clutch automatic by hand and turn machine slowly ahead until the elevator slide head center screw just touches the vise cap, and stop turning before the mold slide has started forward. With the machine in this position, with starting lever still out, the exact relation of the stop rod pawl on the automatic stop rod and the point of the vise automatic mold disk stop dog can be clearly seen, and if a close adjustment is wanted on the automatic stop rod, it can be seen just how much room there is between the two points. If the setting is to be made on an old machine, be sure the pawl on the stop rod is tight in its bearing. If loose, tighten it, as this will make a difference in the clearance between the pawl points.

To remove the automatic stop rod, have the machine in normal position with the vise closed, and unhook the end of the spring from the stop rod, then

push the starting lever in and the rod will drop down. To tighten the pawl in the rod, use a hammer and drive back on the split part of the rod just below the pawl. When attaching the rod, see that the pin on the side at the lower end is under the bell crank lever.

Now place a thick matrix on vise cap under the center screw of elevator slide cap and see how far ahead the mold disk dog moves forward before it strikes the pawl on the rod. This distance should be very slight, otherwise if a tight line should be sent in, and the points are too far apart, the action of the clutch throwout would be too late, and the machine would over-run and allow the mold to press against the line of matrices with possible damage.

If everything checks correctly, but the clearance is too much, it may be overcome by bending the stop rod to bring the points closer.

The clutch leathers must be free from grit, and the face of the driving pulley must be clean. The thickness of the clutch leathers makes a difference in the distance between the mold disk stop dog and the automatic stop rod pawl. The thicker the leathers the greater the distance will be between the points, consequently the later the clutch will be thrown out.

Justification

For proper justification of a line, the spacebands must be clean, the mold must not have accumulation of metal in the grooves or on the face, the matrices and spacebands must slide freely in the first elevator jaws, the center screw in the first elevator slide must be set so the matrices will not bind in the mold groove, the mold slide must not come forward far enough to bind the matrices and vise jaws, the vise justification rods must be kept free from gum and must be well lubricated. The justification bar must be kept free of any substance that might cause the bottom of the spacebands to slip sidewise and cause damage, especially when a line is sent in containing only one spaceband.

Adjusting the Vise Jaws—When adjusting the vise jaws to bring the type face to the correct position on the slug, the short jaw is adjusted with the set screw, which is at the top of the knife block. To adjust the long jaw, loosen the clamp screw, and turn the knurled bushing to get the proper setting. When that is correct, be sure to fasten the clamp screw tight so that the bushing will not work loose. The face of the type must come flush with the ends of the slug, especially when "twin" slugs are being set for very wide measure; otherwise, if there is a slight indention on the slug, a white line will show where the lines join.

Adjusting the Justification Wedge—The wedge passes between pieces of felt and these should be oiled frequently to allow the wedge to work smoothly. On the bottom of the wedge there is an adjusting screw, and if it should be

necessary to adjust this, have the machine in normal position and bring the wedge down but not far enough to move the wedge block to the right. This adjustment is not often necessary, but it should be right so that the line of matrices and spacebands is completely unlocked after the cast is made.

Care of the Justification Rods and Bar—The top of the justification bar should be kept free from graphite which it may collect from the spacebands. If the bar is too smooth, and there is only one spaceband in the line, the bottom of the band might slide and bend when justification takes place. If the bar is glazed or slippery, rub crosswise with an oilstone to slightly roughen up, *but never grind cross grooves in the bar.*

Imperfect Justification—When a machine does not justify perfectly, it may be due to one of several causes, and various tests must be made in order to locate the trouble. First try a matrix in the first elevator jaw and slide it all the way across to see that it does not bind in either the upper or lower positions, then a spaceband in different positions across the jaws to see that it does not bind on the elevator back jaw. Also examine the duplex rail in the first elevator jaw and see that it does not come so far ahead as to cause the matrices or spacebands to bind.

If a line has failed to justify, examine the matrices in that particular line and see if the trouble is caused by a damaged lug binding in the elevator jaw. Also see that the mold does not come too far forward and bind the matrices. The mold slide should be set so that when the pot comes forward the first time, the mold recedes very slightly from the line of matrices when the pot pressure leaves the mold.

Another cause of faulty justification may be an improper setting of the matrix clearance on the first elevator slide which brings the lugs of the matrices in alignment with the mold groove. If enough clearance has not been allowed, the matrices may bind on the upper edge of the groove when justification takes place. The set screw to give the proper clearance is on top of the first elevator-slide, the left-hand one as you face the front of the machine. It sometimes happens that this clearance will differ slightly when the "flap," or simple two-letter attachment, is used to hold the elevator jaws in the raised position. It is possible that some part of the flap has become bent, holding the elevator jaws higher than the proper distance between the regular and upper positions.

If a line has been set that did not justify properly, reset the same line and make a test in the following manner: Remove the plunger pin for safety, then send the line across with the starting lever pushed in. Shut off the power and when the motor has stopped, pull out the starting lever and turn the machine by hand very slowly with the driving pulley until the justification

levers have raised the justification bar, to come in contact with the spacebands for the first justification; then, if the matrices are not spread out against the vise jaws, test each point carefully to see where the trouble lies. As mentioned before, see that the matrices do not bind in the elevator jaws, and that there is the right amount of clearance between the matrix lug and the mold groove. If the line still does not spread easily, use a light bar to raise up on the justification lever, and see if added pressure will spread the line, and if so, it may be necessary to increase the tension of the justification lever spring.

Lubrication—The justification rods should be oiled frequently and should not be allowed to become gummy. The rear ends of the justification levers where they fulcrum on the shaft should be oiled regularly.

The Mold

When working around the molds, caution must be used so as not to damage them. The molds should be taken off occasionally to be cleaned, using Dixon's Mold Polish, listed in the Linotype Catalogue as X-1588. This polish will thoroughly clean the molds without damaging them.

When the molds are removed, be careful not to loosen the two lower screws which hold the mold keeper in place. If these screws are loosened by accident, be sure the keeper is tight against the top before the screws are tightened.

Do not use damaged mold liners. If a wrong ejector blade has been used and has bent the liner so it will not come flush with the back of the mold, this opening will allow metal to accumulate on the pot mouthpiece and cause "back squirts." The ends of the liners must be smooth, as a slight accumulation of metal or any roughness will interfere with the ejection of the slugs.

Before replacing the mold on the disk, clean the bearing surfaces of the mold and the disk and fasten with the four screws. To make certain the mold seats properly, turn the screws until they are almost but not quite tight, then fasten the center mold cap screws to bring the mold down on its bearing, and tighten the four mold screws firmly.

If the left-hand liner only is to be changed, it is not necessary to loosen the right-hand mold cap screw, but if the size of the body is to be changed, loosen all three, and when fastening the mold cap down, tighten the two end screws first. If the center screw is tightened first it has a tendency to force the mold cap back, and may cause it to bind on the back knife. This is particularly true when changing liners on a 42-em mold. When ordering liners, it is recommended that they be purchased from the Linotype Company as they are accurately made and have the proper taper of .003". If the taper of the right-hand liner differs from the left, it is difficult to get proper trim on the slug.

Never allow the pot mouthpiece to rest against the mold for any length of time as the excessive heat might draw the temper out of the mold or cause it to become warped.

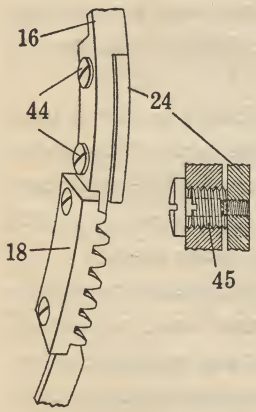
Mold Disk and Slide

As the first elevator descends to the casting position, the mold disk makes one-quarter of a turn and it is important that the disk turns freely so that when the mold slide advances, the locking studs in the mold disk will be in line with the stud blocks in the vise frame.

Lack of oil in the mold disk bearing or metal wedged between the back trimming knife and the disk will prevent its free movement. If metal has accumulated between the back knife and the disk it may be because the knife is dull or incorrectly set.

The brake on the mold turning shaft should have just enough tension to prevent the momentum of the disk from carrying the disk too far.

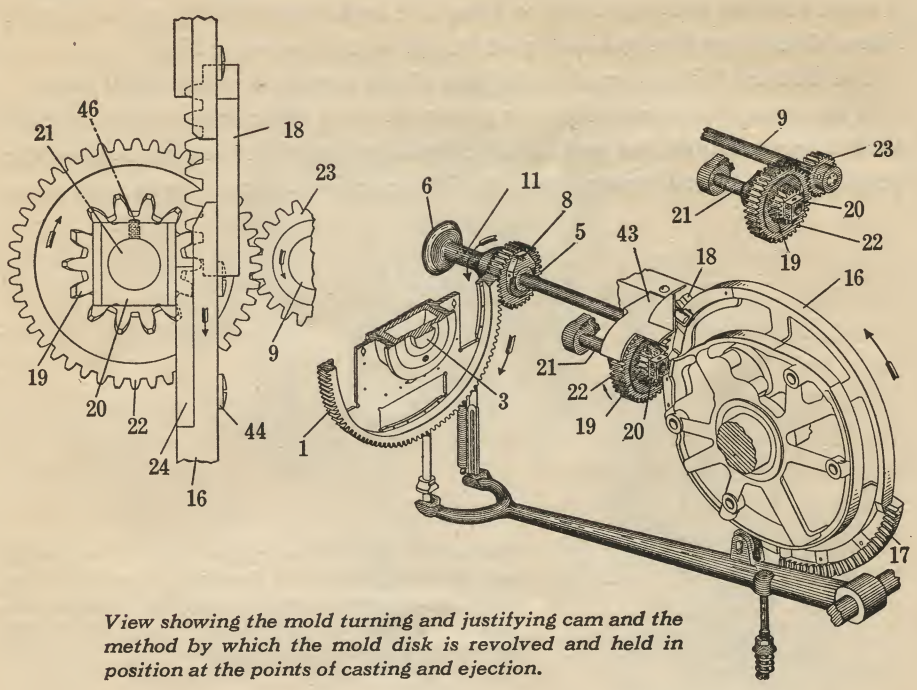
If the mold disk is noisy when it advances, adjust the shoes on the mold turning cam so that when they come in contact with the square blocks on the mold turning pinion, the mold disk locking studs will be in position to enter the stud blocks freely and without noise.



This is one of the segments of the gear rack which revolve the shaft turning the mold disk. Also shown is the steel shoe which runs alongside the square block and holds the mold disk in position to slide freely on the mold disk locking stud blocks at casting and ejection.

Adjustments of the Mold Turning Mechanism—The mechanism of the mold turning shaft is shown on page 13. The smoothness of the operation of the mold disk depends on the proper setting of the steel shoes *24* in relation to the square block *20*. The hardened steel shoe *24* is adjustable by means of a threaded bushing, as shown in the illustration directly above.

When making this adjustment, remove the guard *43*, which is fastened to the machine with one screw. Then start the machine and allow the first elevator slide to descend until it rests on the vise cap, and shut off the machine *before* the mold disk has started forward to engage the mold disk locking



View showing the mold turning and justifying cam and the method by which the mold disk is revolved and held in position at the points of casting and ejection.

studs. The steel shoe *24* will then be in contact with the square block *20* and in this position the amount of play between the shoe and the block can be seen when the shaft *9* is rocked backward and forward by hand, using the handle *6* to obtain this motion.

If there is excessive play between these parts, allow the machine to advance to where a screwdriver may be used for removing the screws *44*, shown in the illustration on page 12. The screws should be removed one at a time to prevent the shoe *24* from dropping off the cam. After the screw has been removed, turn inward on the screw bushings *45*. One complete turn of the bushings will give a movement of .050", so when making the adjustment, only a fraction of a turn should be made before testing. Tighten the screws *44*, and, with a micrometer or calipers see that the distance in relation to the outer edge of the cam is the same at both ends of the shoe, then bring the machine to normal position and turn it by hand to see that the shoe does not bind excessively against the square block.

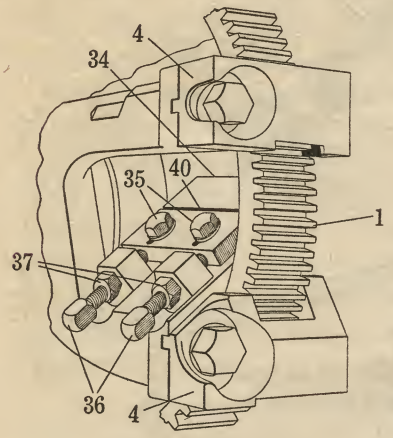
Turn the machine to the ejecting position and examine the shoe and square block at that point, and adjust if necessary in the same manner as described. Several trials may have to be made to get the exact adjustment.

This adjustment must be made properly. When the mold disk is revolving

it must turn far enough ahead to bring the mold disk locking studs in exact line with the stud blocks to advance freely, without noise or bind.

See that the felt, fastened to the side of the guard *43*, is kept well oiled.

If necessary to remove the spur pinion *22* from the machine, turn the cam shaft backward until the mold disk comes ahead against the pins, remove the guard *43* and loosen the set screw *46*. The machine will now be in position so



View of the back trimming knife and the adjusting and clamping screws for bringing the edge of the knife in the correct position against the mold, so that it will trim the bottom of the slug and at the same time will not score the mold.

that the back end of the shaft may be pried forward slightly to start it and the opposite end will then protrude enough to allow the shaft to be wedged out with a large screwdriver or similar tool. To replace the gear, have the machine with the mold disk ahead on the pins, and this will bring the steel shoe *24* in contact with the square block *20*. In this position there will be no possibility of getting the shaft out of time. The square with the set screw *46* must remain at the top as before, and when the gears are correctly meshed, the shaft will go into place easily.

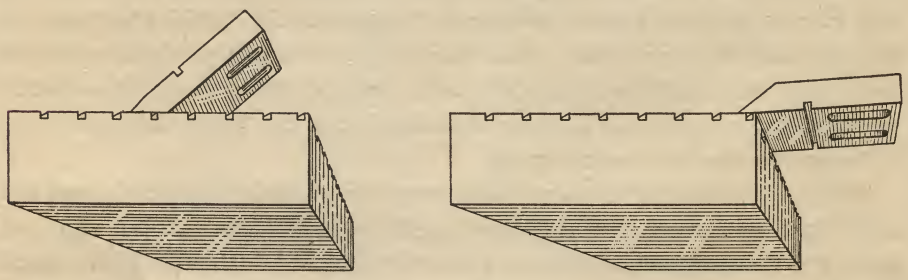
Adjusting the Back Knife—The knife which trims the back of the slug as the mold disk revolves past it, should be sharpened frequently to keep the cutting edge in good condition.

If trouble is experienced with slugs that are more than type high (.918″), lower the vise to the first position, disconnect the mold slide and pull the slide forward to clear the small gear. Then remove the back knife *34* shown in the illustration just above, and see if the upper and lower mold disk guides *4*, are resting against the front surface of the mold disk. If there is any space between them, loosen the screws and tap them back until there is no lost motion; then turn the mold disk to see that it turns freely, does not bind in the guides, and is properly oiled on its bearing.

When replacing a back knife, loosen the lock nuts *37*, and turn out slightly on the adjusting screws *36* until there is sufficient room for the knife between the set screws and the mold disk, then turn the clamping screws *35* nearly tight and have the knife very close but not quite against the mold disk. Rub red lead on the back surface of the mold and turn slowly on the adjusting screws *36* until the knife touches the base and cap of the mold evenly as it is moved past the knife. When setting, if one side of the knife has been brought too close, loosen the adjusting screw *36* on that side and place the point of an iron-handled screwdriver in the slot *40* of the knife and drive down toward the adjusting screw without loosening the clamping screws. When properly adjusted, tighten the clamping screws. Hold the heads of the adjusting screws with a pair of pliers or a small wrench so that they will not move and disrupt the adjustment when the lock nuts are tightened.

The proper setting of the back knife is very important. It must be close enough to trim the slug type high, and the disk must turn freely when the operator changes molds. If the disk turns hard, the locking studs will not align properly to enter the stud blocks when the mold slide advances.

Sharpening the Back Knife—If the cutting edge of the back knife is nicked or very dull, it should be sent to the Linotype Company to be properly ground. Always have a sharpened knife on hand ready for use at all times.



Showing correct procedure in sharpening the back knife.

If the knife is not neglected too long, it is possible to maintain a good cutting edge by removing the knife from the machine and dressing the edge in the following manner: Use the lapping block, part number F-317, which can be obtained from the Linotype Company. Sprinkle the surface with No. 120 emery powder, X-491, also available from the Linotype Company; then moisten with kerosene.

Holding the knife in the position shown to the left in the illustration on this page, rub over the surface of the lapping block. Then holding knife as shown to the right, rub lightly until a sharp, even edge has been obtained.

It is important that the original bevel of the cutting edge is not changed, and care must be taken to hold the knife against the lapping block in such a way that this cannot happen. The condition of the back of the slugs will indicate the necessity for the above treatment of the back knife.

Adjusting the Movement of the Mold Slide—To adjust the mold slide so that there is proper clearance between the face of mold and matrices when justification takes place, the mold cam roll eccentric pin *92* (in the illustration on page 17), must be adjusted when the mold cam roll *91* is on the section of the mold slide cam shown at *83* which is the highest point of the cam. When the eccentric pin is properly adjusted the space between the face of the mold and the vise jaws or matrices should not be less than .003" or over .005". Adjusting the eccentric pin handle toward the rear of the machine moves the mold slide forward; adjusting the handle toward the front of the machine moves the mold slide backward. This setting is extremely important and if improperly made will result in trouble in justification.

Before making the adjustment of the eccentric pin it will be necessary to release the pressure of the pot lever spring. This is done by removing lock nuts *84* and *85*, wing pin *86* and eyebolt *87*. Never disturb lock nuts *89* and *90*.

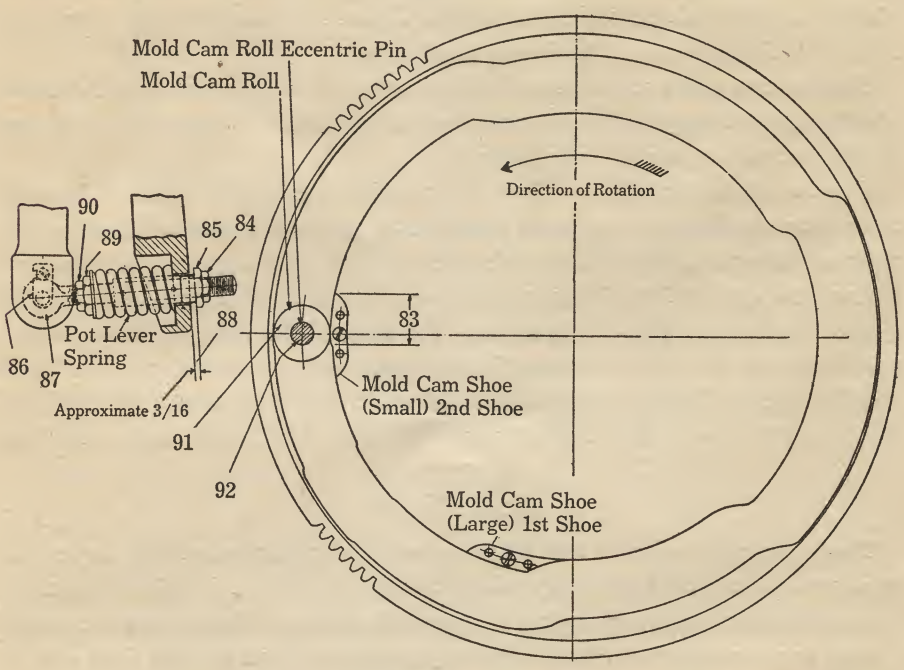
This adjustment of the eccentric pin is made as follows: Remove the first elevator back jaw and also remove the line stop. Close the left-hand vise jaw and run the machine around until the first elevator rests upon the vise cap. Place a strip of ordinary newspaper (measuring .003" thick) between the vise jaw and the face of the mold. Then move the machine ahead until the mold cam roll is on the section of the mold cam at *83*. With the machine in this position, there should be a slight resistance when the paper is pulled from between the vise jaw and the mold.

When the proper adjustment has been obtained, the eccentric pin lock nut must then be turned very tight so that the eccentric pin will not slip, and while it is being tightened it may be necessary to hold the handle with a small wrench or a piece of pipe to keep the eccentric pin from changing its position.

After completing the setting of the mold slide, allow the machine to complete its revolution. Then replace the first elevator back jaw, being careful to put the screws back in their correct positions, as the one screw is somewhat longer and will extend through the jaw and damage the safety plate if their position is reversed. Also replace the line stop.

When the jaw and line stop have been replaced, allow the machine to run ahead until the first elevator rests upon the vise cap. With the machine in this position, the pot lever spring can again be connected. Then run the machine ahead to the casting position and make sure the space between the pot lever and the lock nut is approximately $\frac{3}{16}$" as shown on page 17.

When the mold slide is in normal position, it is supported on the left-hand side by a support screw. This support screw seldom needs attention, but after considerable use it may become worn too much to support the mold slide properly. To adjust this screw, have the mold slide in normal position and



View of the mold cam and driving gear when standing at right-hand side of machines, showing the mold cam roll and eccentric pin.

remove one mold from the disk and turn the opening to the ejecting position which will expose to view the mold slide; then raise up on the mold disk guide and insert a strip of paper between the lower right-hand side of the mold slide and the column of the machine. After loosening the support screw lock nut, turn the support screw up until the paper can be withdrawn, and then tighten the lock nut.

Adjusting Mold Disk Locking Stud Block—When the locking studs and stud blocks become too much worn it will be almost impossible to trim the slugs parallel, and it may be necessary to replace the locking studs and the stud blocks. The stud blocks are doweled to the vise frame, and when new blocks are put on, the dowels will generally bring them to the right position as they are made interchangeable. After the new locking studs and stud blocks have been fastened in place they should be tested. To do this, disconnect the

mold slide and pull the disk forward on the locking studs to see that they do not bind, and also see that the ejector blade is in line with the base of the mold when the blade comes forward. If the blade does strike, or the locking studs bind in the stud block, it may be necessary to remove the dowel pins from the blocks and fasten them loosely to the vise frame; then see that the ejector blade is correct in relation to the mold. Tighten the stud blocks evenly so that the locking studs will be free in the blocks.

The locking studs are fastened to the mold disk with a screw in the back which passes through a keeper, and should be examined occasionally to see that the screws have not worked loose.

Removing the Mold Slide—Run the machine ahead until the first elevator rests upon the vise cap, stop the machine by pushing back the starting and stopping lever and then shut off the power. Remove the pot pump plunger pin and the ejector lever link; lower the mold cam lever handle; remove the ejector blade controller link rod, and the controller. Open the vise to first position; raise the first elevator slide by hand, and lower the vise to a horizontal position. Detach the hose from the mold disk stud, first turning off the water, and the mold slide is then free to be removed bodily from the machine.

Mold Wipers

The back mold wiper is for the purpose of keeping the back of the molds free from metal accumulation, and should be adjusted so it will rest against the mold disk when the machine is in normal position. The felt on the wiper should occasionally be rubbed with dry graphite. If oil is used, it is apt to come through the mold and foul the matrices.

The felt on the front mold wiper should bear against the face of the molds when the mold disk turns. The felt on this mold wiper also should be occasionally rubbed with graphite.

Metal Pot

The product of the machine depends largely on the care and adjustment of the metal pot. The pot legs must be adjusted to bring the mouthpiece in alignment with the mold, otherwise the machine is apt to "back squirt." Other causes of back squirts are damaged mold liners, a broken or weak pot lever spring, improper adjustment of the pot lever, metal on the back of the mold, the metal temperature too high or too low, or a foul plunger which "jumps" just before it descends and forces metal between the mouthpiece and the mold to prevent a good lockup. The metal temperature should be checked with a special thermometer which may be obtained from the Linotype Company and is listed in the Linotype Catalogue as X-1480.

To obtain a solid slug with a clear face the metal must be of standard quality, the holes in the mouthpiece must be fully open, the vents in the mouthpiece must be sufficient to allow the air to escape from the mold, the pot plunger spring must not be too weak, the holes in the sides of the pot well must be kept open, and the metal in the pot must be kept at the proper level.

It is difficult to get a solid slug if the plunger is worn enough to allow metal to escape around the sides of the well when it descends, or if the vent in the bottom of the plunger is open too much. If the plunger is badly worn, replace with a new one of standard size, but if the pot well is worn, it may be necessary to install an oversize plunger. Oversize plungers are obtainable from the Linotype Company and will be furnished .005, .010, or .015″ oversize as specified with the order.

It seldom happens, but it is possible for a plunger to stick in the well at the bottom of its stroke. If this does happen, push in the starting lever and withdraw the plunger pin; then allow the machine to come to normal position so that the pot mouthpiece will not rest against the mold. Dip metal from the pot until the well is exposed, then put some tallow or oil on the top of the stuck plunger and allow it to soak in. Grip the plunger rod with a monkey wrench and try to rock it from side to side; at the same time, with a light hammer tap the top of the plunger rod. Work the plunger upward slowly with a rotary movement and when it is removed both the well and the plunger should be cleaned thoroughly.

If the plunger is exceptionally hard to remove, additional leverage may be obtained in the following manner: Use a ⅜″ bolt about two inches long with two nuts. Fasten the bolt in the plunger rod opening, one nut on each side, then use a length of pipe with the end over the bolt head and place some blocking on the outer edge of the pot underneath the pipe. Then use the pipe as a lever to pry upward on the plunger rod. Grip the plunger rod with a monkey wrench and turn from side to side while the rod is being pried upward.

It is a custom in many printing plants to clean the plungers daily, and this rule should be observed while the machine is new, but after continued use the plunger and well may become slightly worn and it may not be necessary to clean so often. Watch the plunger as it descends, and if it has a continued downward movement to the bottom of the well, it will not be necessary to clean every day. If a plunger fits loosely in the well, daily cleaning would be a detriment rather than a help.

The Pot Mouthpiece—The vents in the mouthpiece are for the purpose of allowing the air to escape when the plunger is forcing metal into the mold, and they should be quite broad, with a small opening at the lower end. Scrape the vents occasionally to remove any accumulation of dross. The opening at

the bottom of the vent should show a slight drip of metal at each cast and the amount of vent can be seen at the back of the mold if the machine is shut off just before the slug reaches the back knife.

A scraper for the vents can be made by grinding the end of a file to a V-shape. Always scrape the vents toward the bottom of the mouthpiece.

After the machine has been used for some time, the holes in the mouthpiece should be reamed slightly at the front end where the mouthpiece comes in contact with the mold. This will remove any burrs or dross deposits that may have formed, so that when the pot breaks away from the mold, the metal will adhere to the base of the slug instead of staying in the mouthpiece holes, and also when casting a slug of thin body size, the pot will break away from the mold much easier if the holes are reamed.

If no reamer is available, a small three-cornered file, with the end ground to give it an edge, will serve the purpose. The holes must not be enlarged: the reaming must be just enough to remove the burr. If the holes in the mouthpiece become clogged, drill out with a No. 52 drill. The holes in the mouthpiece have a slight taper; the original measurement is about .062″ at the back and .070″ at the front.

If it becomes necessary to remove the mouthpiece, use a pot mouthpiece screw loosener, listed in the Linotype Catalogue as F-2860. Place the tongue of the loosener in the screw slot and with a hammer give it two or three raps against the screw head to ease it from its seat. Then with a heavy screwdriver fitting closely in the screw slot, press firmly against the screw and give a quick snap to the screwdriver, which should loosen the screws.

Before replacing the mouthpiece, clean the surface of the crucible and the back of the mouthpiece—a fine oilstone having a straight surface or a piece of fine emery cloth placed on a block of wood may be used on the crucible. For the mouthpiece use emery cloth placed on a flat surface and rub until bearing shows evenly all around the mouth of the crucible.

If the throat of the pot has become fouled with hardened dross, it can be removed with a pot throat cleaner, listed in the Linotype Catalogue as F-4236.

When the mouthpiece is ready to be fastened in place, spread a small amount of heavy oil over the surface (do not use red lead on the back of the mouthpiece or on the screws), and tighten the screws evenly.

Testing the Lock-up—When the machine leaves the factory, the pot legs are adjusted to bring the mouthpiece in perfect alignment with the molds, but after the machine is in daily use, the continuous heat may cause certain parts to warp, and cause a poor lock-up, making it necessary to adjust the pot legs.

To make this test, open the vise to the first position, disconnect the mold slide and pull the mold disk forward. Then clean the surface of the mouth-

piece by rubbing very lightly with a fine oilstone that has a straight surface, and also see that the back of the mold is clean. Then mix some powdered red lead with oil to make a paste and with a rag, cover the back of the mold with a light coating of the mixture. Push the mold slide back to normal position, with the mold that has been red-leaded at the top of the disk directly in front of the mouthpiece. Close the vise and remove the pot pump plunger pin.

When making the lock-up, test in this manner: The mold disk must remain stationary until the machine has made a complete revolution to the normal position. To accomplish this, pull forward on the mold disk pinion until it is out of mesh with the pin in the flange of the mold turning shaft, then pull the starting lever. With the handle, hold the pinion out and keep it steady so that when the mold disk advances the locking studs and blocks will line up.

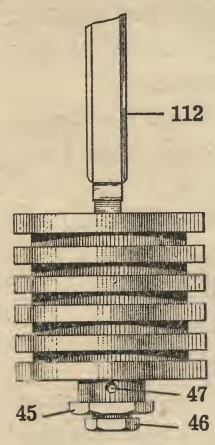
The pinion must be held fully out until the machine has come to the normal position, otherwise, if the mold disk was allowed to turn, the back knife would scrape the red lead from the back of the mold.

After the machine has completed its revolution, lower the vise, pull the mold slide forward so that the mouthpiece may be examined. The red lead now adhering to the mouthpiece will show how it aligns with the mold. If one end of the mouthpiece does not show any red lead, adjust that side forward or the opposite end backward, using the screws in the pot legs.

To bring the left-hand end of the mouthpiece forward, release the lock nuts, loosen the rear screws and tighten the front screws. Only a fraction of a turn should be made on these screws before making another test. When making these tests it should also be noted if the mouthpiece has the same bearing at the top and bottom. If the mouthpiece does not show a good bearing at the bottom, loosen the back screws on both pot legs as evenly as possible (the number of turns on the screws depending on how much the mouthpiece is out of line with the molds), and then tighten the front screws. Reverse this process if the bearing appears light at the top. Bring screws just against the pot leg bearings (not too tight) and fasten lock nuts. After the pot legs have been adjusted as closely as possible, the mouthpiece may show some high spots and it may be necessary to true it up with an oilstone. When making these tests the ejector blade should be set to the shortest width to prevent the blade from striking a mold liner.

The power lock-up as given above can safely be used when it is known that the alignment is only slightly off, but if a new pot and crucible are to be installed it is well to use the hand lock-up first to bring the mouthpiece in line with the back of the mold. This is done in the following manner: Turn the machine ahead until the first elevator slide rests on the vise cap. Then open the vise, disconnect the mold slide by removing the ejector lever link and pressing

down on the handle of the mold cam lever, then pull forward on the mold slide. See that the back of the mold and the mouthpiece are both clean, then with a rag cover the back of the mold with a thin coating of red lead paste; push the mold slide back and see that the disk is properly meshed with the small driving pinion. Close the vise and push the left-hand vise jaw to the right. Then pull the mold slide forward onto the locating studs with a thin bar placed between the pot lever and the bracket. Force the pot all the way ahead two or three times to bring the red lead on the mold in contact with the mouthpiece. Then push the mold slide away from the locating studs, open the vise, pull forward on the mold slide and examine the mouthpiece. If the red lead does not show evenly all the way across, adjust the pot legs in the same manner as previously described, until the mouthpiece is in correct alignment with the mold. It may be necessary to repeat the above operation to obtain a satisfactory lock-up.



Showing details of pot pump plunger vent adjustment. 45 is the vent adjusting screw lock nut; 46, adjusting screw; 47, vent hole; 112, plunger rod sleeve.

The holes in the mouthpiece should come just above the base of the mold and the holes at each end must not be covered. This adjustment is made with the screws on top and bottom of pot legs.

The Pot Pump Plunger—The metal pot pump plunger should move up and down freely within the pot well but should fit closely enough to prevent any leakage of metal between these parts. The plunger must be kept clean so that when casting a line it will continue steadily on its downward stroke until it is raised by the cam. If it does not complete its full stroke a ring of dross may have accumulated in the well and it must be cleaned out.

On the bottom of the pot pump plunger (see illustration on this page) there is a lock nut *45* and a hexagon-head adjusting screw *46* with a hole drilled across the body in line with the vent hole *47* which is drilled horizontally across the projection at the bottom of the plunger. There is a hole drilled through the bottom of the plunger to meet this opening.

To adjust the size of the opening *47*, loosen the lock nut *45* and turn the screw *46* until the vent is the desired size.

When setting the smaller size slugs, the vent acts as a relief valve to let excess metal escape upward through the plunger. Thus the plunger goes deeper into the well and prevents dross from collecting on the plunger and the sides of the well. In most cases the vent should be set to have the opening wide enough to insert a $\frac{1}{16}$" wire. If too much vent is given, the plunger will not have enough force to fill the mold when casting the larger size slugs.

The plunger rod sleeve *112* acts as an insulator to prevent the accumulation of metal on the plunger rod. The sleeve is tightly fitted at the ends while the center section is expanded to form an air space.

A foul plunger may bind at the top of the well and not allow the pot lever roll to drop against the cam after a slug has been cast, which would leave the pot ahead of its normal position, and the holes in the side of the well would be covered by the plunger, resulting in hollow slugs.

The holes in the sides of the well must be kept fully open to allow the metal to flow under the plunger when the machine is in normal position. A pot mouth wiper, F-304, is usually furnished with the machine and a hook on this wiper is used to open the holes.

The level of the metal in the pot should be maintained as evenly as possible, about ½" below the top rim of the crucible. Various types of metal feeders are available to keep the metal at the proper level continuously.

Back Squirts—A splashing of metal over the back of the mold disk is called a "back squirt" and may happen for various reasons.

The first thing to test when a back squirt occurs, is the lockup of the mouthpiece against the mold in the manner described previously.

Causes of back squirts are: metal in pot too hot or too "cold;" mouthpiece overheated, or not hot enough to keep the metal from chilling on its surface. The compression spring, shown in the illustration on page 17, may be broken or too weak, or the adjustment may be wrong between the pot lever and the shoulder nut *85*—the clearance should be $\frac{3}{16}$" to give the spring the proper compression when the pot is locked against the mold.

It is also possible that one of the anti-friction rolls in the pot cam roll may be broken. If it is necessary to remove the pot lever, take out the wing pin *86*, which holds the eyebolt *87* at its front end. At the top, the pot lever is held by a rod which extends through two lugs at the back of the pot jacket. To disconnect it, loosen the set screw and remove the rod. Then the pot lever can be taken out without disturbing the adjustment of the compression spring.

At the first sign of a back squirt, push the starting lever in to shut off the machine, and if there is not too much metal behind the disk, lower the vise and pull out on the handle of the mold turning pinion and try to turn the mold disk backward to move the metal away from the back knife. Then disconnect the mold slide and pull the disk forward and with a steel hook and a screwdriver, scrape the metal loose, being careful not to damage the molds. If the metal has wedged the mold disk tight, it may be necessary to pry it backward far enough to free the metal so it can be scraped out. After the metal has been removed, clean the mouthpiece with a rag, and examine the inside rim of the mold disk to make sure that no metal particles remain. Push

the mold slide into place, having the small pinion and the mold disk in mesh so that the spots will be opposite to each other when the machine is turned to normal position.

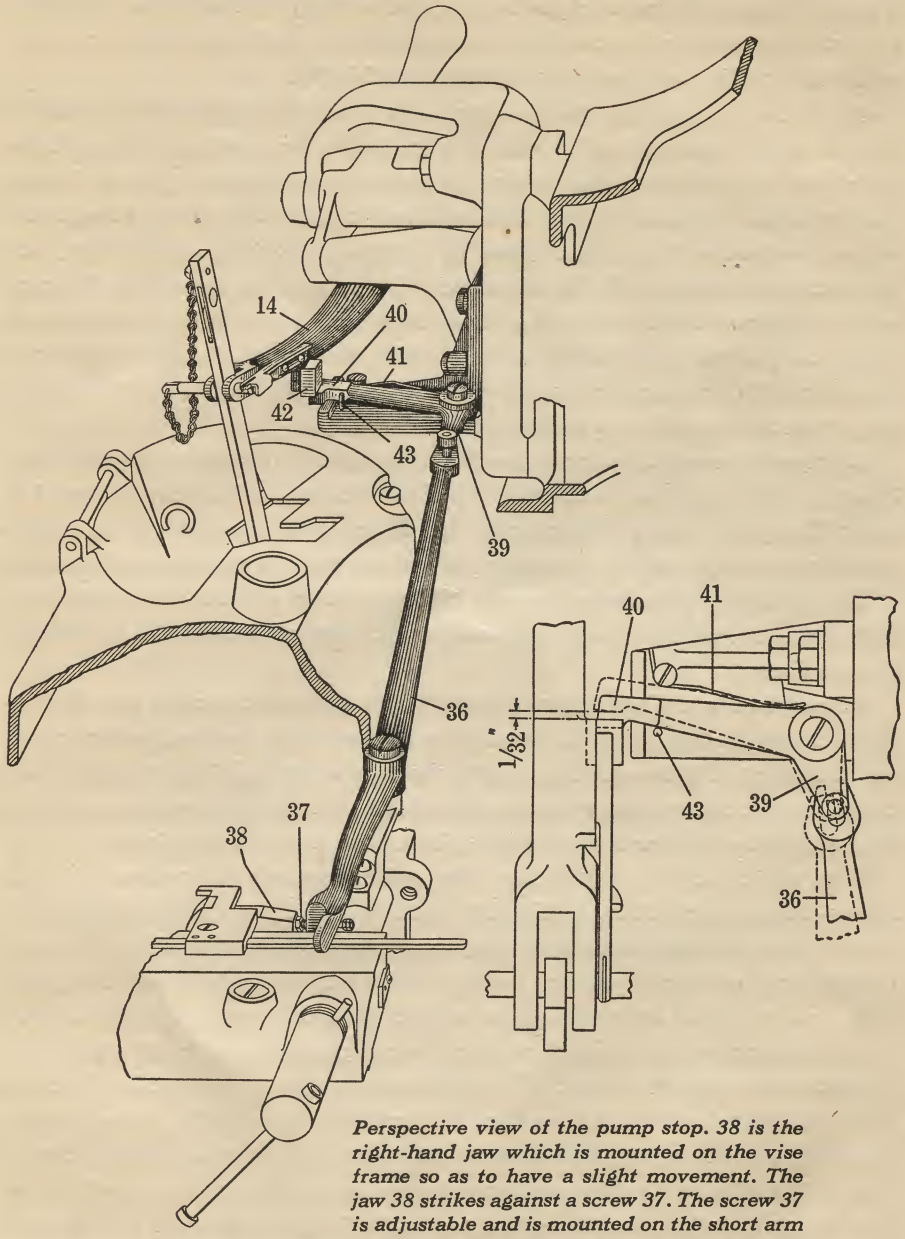
Automatic Pump Stop—The pump stop, when adjusted correctly, will prevent the pot plunger from operating if a short or improperly spaced line is sent in. When the machine is in normal position the short lever of the pump stop should be underneath a hardened block on the pump lever. The adjustment for the pump stop is made with a set screw in the end of the long connecting lever at the end of the right-hand vise jaw. When the line is fully justified, the short lever must be adjusted so it will just clear the hardened block on the pump lever.

The lever *36*, shown in the illustration on page 25, which controls the pot pump stop, reaches to the end of the right-hand jaw *38* and has an adjusting screw *37* which rests against the jaw and should be adjusted so that the stop lever *40* will just clear the stop block *42* on the plunger lever when the line is fully justified. Too much clearance will allow a line that is not *quite* full to cast, and the slug will probably show hairlines.

The spring *41* on the stop lever should have sufficient strength to hold the lever under the stop block *42* in case a very short line is sent in, as this creates a slight pressure on the right-hand jaw when the justification levers operate and the spring on the stop lever must be strong enough to overcome it. Sometimes a slight splash of metal gets under the stop lever and causes it to bind; also, as various parts of the machine wear, the stop block *42* might not be lifted high enough to allow the stop lever *40* to come underneath. If such a condition should arise, the holes in the bracket could be elongated to lower it, as there are no dowels in the bracket.

Pot Mouthpiece Wiper—The pot mouthpiece wiper is bolted to the back of the face plate of the machine and is operated by an extra cam which is built on the side of the first elevator cam. The wiper, which operates with a vertical motion, is faced with a heat-resisting material which wipes the mouthpiece on both its downward and upward stroke. The wiper is brought into operation just after the line is transferred. If desired, the wiper can be made non-operative by pushing in on a slidable pin which is located on the short arm of the operating lever. The face of the wiper must be adjusted so that when it operates it will bear evenly along the entire length of the mouthpiece and will wipe the whole surface of the mouthpiece uniformly.

Semi Quick-Drop—The "semi quick-drop" pump cam shoe is standard equipment on most new machines. The shape of this shoe gives more "snap" to the plunger action and helps to produce a better face. On some of the older machines this shoe is rounded at the rear end and hence the plunger action



Perspective view of the pump stop. 38 is the right-hand jaw which is mounted on the vise frame so as to have a slight movement. The jaw 38 strikes against a screw 37. The screw 37 is adjustable and is mounted on the short arm of a lever 36. The long arm of this lever 36 is connected to the short arm of another lever 39; the long arm of the lever 39 has a finished surface 40 on its outer end which operates under a hardened block 42 mounted on the pump lever. The finished surface of the lever 39 is normally under the block 42, being held there by a spring 41 against the stop pin 43.

is more sluggish. If the machine is equipped with the rounded shoe, the type face will be greatly improved if it is replaced by the semi quick-drop shoe, which is listed in the Linotype Catalogue as C-1138.

Quick-Drop Attachment—The machine is also equipped with what is known as the "quick-drop" which is used *only* when casting display faces. This attachment causes the plunger to make a sudden drop, quickly forcing the metal into the face of the matrices. The pot pump lever latch swings on a screw attached to the plunger lever. To put the quick-drop in operation, turn the latch down to the left, and when the machine makes a revolution the latch will be engaged by the pot pump lever latch cam which is fastened directly under the pot pump shoe. When the contact between the latch and the cam ends abruptly, the plunger is allowed to drop suddenly, forcing the metal from the pot to the face of the matrices instantaneously.

Linotype Gas and Electric Pots—Full descriptions of the Linotype Gas and Electric Pots are given in Chapter 13 of the "Linotype Machine Principles" book. Complete wiring diagrams for the Electric Pot, together with a comprehensive analysis of the cause and remedy of various troubles are included.

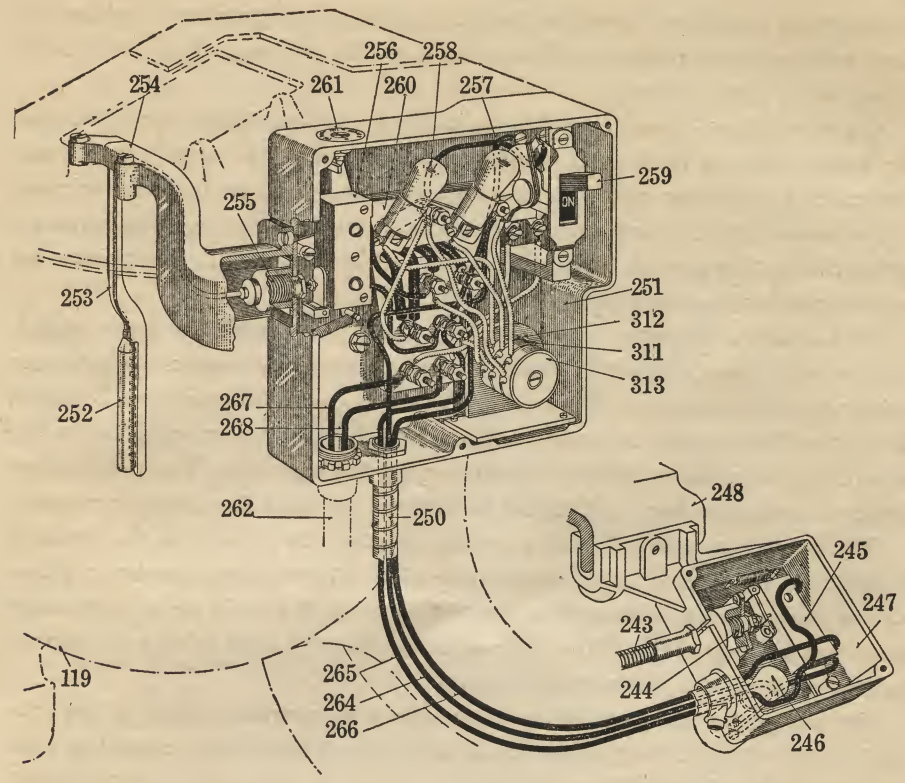
The following adjustments given in this booklet should be studied carefully since, if properly made, they will assure correct operation of the Micro-Therm Control.

Adjustment and Care of the Micro-Therm Electric Crucible and Mouthpiece Controls—The illustration on page 27 shows the various parts comprising the Micro-Therm electric control for 220 volts A.C. The wiring differs somewhat for other types of current but the expansion unit, switches, indicating lamp, etc. are essentially the same. To adjust, proceed as follows:

Turn switch *259* to *on* position. The switch controls the current for both Micro-Therm units. Lamps *257, 258* and *246* will light if metal is cold and lamp *257* will remain lighted as long as current is *on*. Lamp *258* will remain lighted only as long as current flows to the crucible heaters, and lamp *246* will remain lighted only as long as current flows to the mouthpiece heaters.

After the metal has melted, remove the pot plunger and insert a glass rod thermometer in the pot well. When the thermometer registers 535° F., lamp *258* should go out indicating that the crucible mu-switch contacts have opened. To increase temperature turn pointer on adjusting screw *261* toward "hotter" on dial, or to decrease temperature turn pointer to "colder" on the dial. If it is found necessary to change pointer *261* to obtain the temperature reading of 535°, the factory setting of the expansion tube plunger adjusting nut should be readjusted as follows:

1. Turn adjusting screw dial *261* until pointer registers with the 535° mark.
2. Turn power switch on and allow metal to heat up. When temperature



View showing both the mouthpiece and crucible Micro-Therm control units wired for 220 volt alternating current.

reaches 535°, lamp *258* should go out indicating that the mu-switch *256* has shut off the current to the crucible heaters.

3. If lamp *258* does not go out at 535° or goes out before the temperature reaches 535°, the setting of plunger adjusting screw should be changed. Loosen lock nut and turn adjusting screw counter-clockwise to decrease temperature and clockwise to increase temperature. Tighten lock nut securely when proper adjustment is reached.

On later Micro-Therm Controls, a different type of adjusting screw dial is used. A raised dial is fastened to the adjusting shaft by two set screws. It is possible, therefore, to adjust the temperature to 535° by means of this dial and then loosen the two set screws and turn the dial so that the 535° mark agrees with the indicating line on top of crucible control box.

To adjust mouthpiece control, remove cover from mouthpiece control box. The pointer and adjusting screw are fastened to the mouthpiece control box cover and are removed with it. Turn plunger adjusting screw counter-clockwise

to decrease temperature or clockwise to increase temperature. Tighten the lock nut, set the mouthpiece pointer to 0 on the dial and then replace the cover and adjusting screw.

On later Micro-Therm mouthpiece controls the setting of the control may be made without removing cover. After removing the lamp "jewel" and loosening the pointer set screw, the adjusting shaft can be turned clockwise to increase temperature and counter-clockwise to decrease temperature. After this setting is made, pointer should be set at 0 on the dial, the pointer set screw tightened and the "jewel" replaced.

To replace a damaged expansion tube and bulb assembly move switch *259* to "off" position, remove guard *254* and four round-head screws from the cover of the expansion bellows *255*. The expansion bulb can then be lifted from pot. The plunger adjusting screw assembly should be transferred to the new bulb. Reverse procedure when inserting the new bulb. The mouthpiece control expansion tube and bulb assembly is replaced in a similar manner.

The expansion tube and bulb assembly must not be inserted in the pot until it has been exposed to room temperature (70° F.) for at least one hour. When the expansion bulb is inserted in the pot crucible, it should be ½ inch away from the heating units. If the bulb is closer than ½ inch, it may be permanently strained and will operate incorrectly.

Do not permit the crucible or mouthpiece to overheat (600° F. for crucible, 525° F. for mouthpiece) since this may damage the expansion tube and bulb of the Micro-Therm Controls.

Adjustment and Care of the Mechanical Thermostat—The thermostat has been accurately adjusted at the factory but must always be readjusted when placed in service. These adjustments should be made as follows:

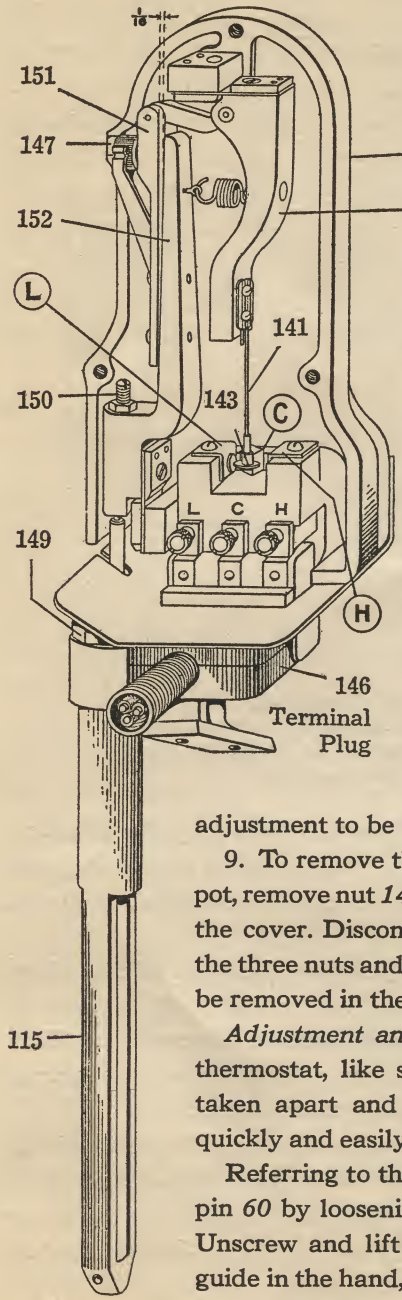
1. Turn the pot switch to the *on* position and note that contact lever roller *143* (see illustration opposite) is touching contacts *C* and *L*. In this position the current is on the crucible heaters and the metal will begin to heat.

2. After the metal has melted, insert a glass rod thermometer and when it registers 550° F., note that contact lever roller *143* has rolled over contact *C* and is now touching contacts *C* and *H*. In this position the current is off the crucible heaters and the metal will begin to cool.

3. When the metal has cooled so that the thermometer registers 535° F., note that the contact lever roller *143* has again rolled over contact *C* and is now again touching contacts *C* and *L*.

4. The foregoing is the normal cycle of operations and will be continued as long as the pot switch is left in the *on* position.

5. The contact lever roller support *141* is made of spring wire and is set so that the contact lever roller *143* will easily roll over contact *C* and touch con-



Mechanical Thermostat

tact *H* when the thermometer registers 550° F. and contact *L* when thermometer registers 535° F. The contact roller *143* can be adjusted by carefully bending the contact lever roller support *141*.

6. Temperature regulation above or below normal is controlled by the knurl-headed screw *147* which has a screwdriver slot and may be reached through a hole in the cover. Turning this screw to the left reduces the temperature and turning it to the right increases the temperature.

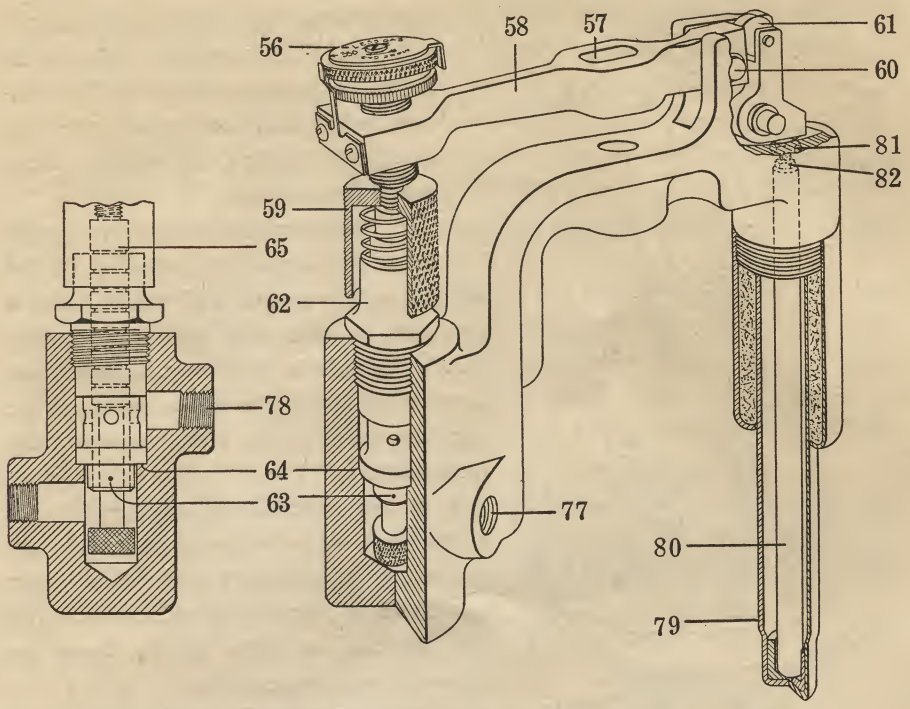
7. Screw *150* is also an adjustment, but is used only when replacing parts or making rough adjustments if the thermostat has been subjected to extremely high temperature, or after having been removed from a frozen pot.

8. It is important in making this rough adjustment with screw *150* that a clearance of at least $\frac{1}{16}$" be allowed between parts *151* and *152* to provide for the close adjustment to be made by screw *147*.

9. To remove the thermostat and pot cover from a frozen pot, remove nut *149* and the two screws holding thermostat to the cover. Disconnect terminal plug *146* by first removing the three nuts and lift off thermostat. The pot cover may then be removed in the regular way.

Adjustment and Care of the Gas Pot Thermostat—This thermostat, like similar gas controlling devices, should be taken apart and cleaned occasionally. This can be done quickly and easily if the following instructions are observed:

Referring to the illustration on page 30, remove fulcrum pin *60* by loosening set screws, and then take out lever *58*. Unscrew and lift out plunger guide *62*. Hold the plunger guide in the hand, unscrew the spring cap *59* and remove the plunger *65*. These parts are assembled by hand in the factory and the use of tools or vise may disturb the alignment. Clean



View of the Gas Pot Thermostat. 56 is the adjusting dial; 57, clearance hole for screwdriver; 58, lever; 59, spring cap; 60, fulcrum pin; 61, roller; 62, plunger guide; 63, by-pass; 64, seat for guide; 65, plunger; 77, gas inlet; 78, outlet; 79, steel casing; 80, invar rod.

out by-pass *63*, wipe off and rub plunger *65* with a little graphite. When reassembling do not try to screw plunger guide *62* down to the hexagon head, as it seats on bottom, as shown. Lubricate fulcrum pin *60* with graphite. Do not use oil.

The thermostat is calibrated and the adjustment shown at *81* and *82* set at the factory, where the gas pressure may vary from that of other localities; therefore, test the thermostat by using a thermometer in the metal pot. When the thermometer registers 550° F., loosen the screw at the top of the thermostat and turn the dial plate *56* to agree with the thermometer.

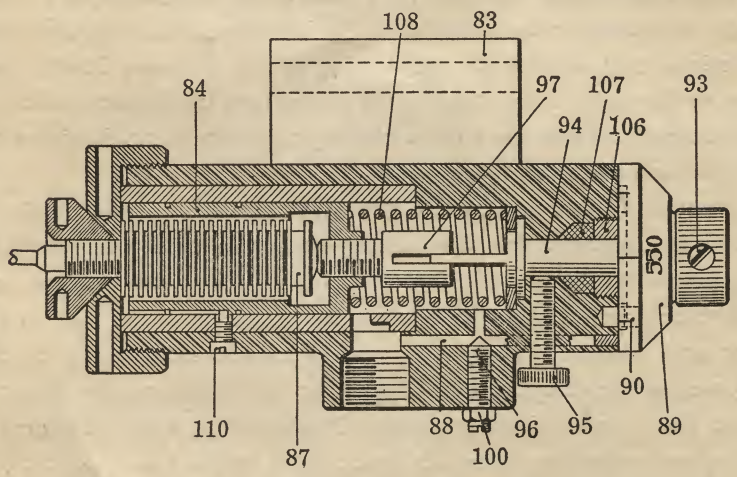
Adjustment and Care of Micro-Therm Gas Control—To calibrate the Micro-Therm control, place a glass thermometer in pot, loosen dial set screw *93* and shaft set screw *95*, shown in the illustration on page 31. Then turn operating shaft *94* to the left or counter-clockwise to raise the temperature and to the right or clockwise to lower the temperature.

When thermometer reaches 550°, adjust shaft *94* by turning to the right or clockwise, until main burner flame is cut down to pilot flame. Line up the

550° graduation mark on dial *89* with one on the casting and then lock dial in position with lock screws *93* and *95*.

The pilot light can be adjusted by first loosening lock nut *100* and then turning the pilot light regulating screw *96* to the right or clockwise to reduce the flame or to the left, or counter-clockwise, to increase the flame. This will regulate the amount of gas flowing through the pilot light by-pass *88*. When making this adjustment the main inlet port should be closed by turning operating shaft *94* clockwise as far as it will go. The by-pass flame should be adjusted just high enough to prevent it popping out.

To replace a damaged expansion bellows, first turn the gas flame down. Remove the expansion bellows tube guard, loosen bellows retaining nut before loosening enclosing nut; then remove bellows tube assembly and replace with new one. Tighten enclosing nut and then tighten bellows retaining nut. To clean, go through the same process with the addition of removing piston



Detailed sectional view of Micro-Therm Gas Temperature Control.

by loosening set screw *110*. Clean thoroughly and wipe piston with graphite before reassembling. *107* and *106* are the packing and packing gland. The expansion tube and bulb assembly must not be inserted in the pot until it has been exposed to room temperature (70° F.) for at least one hour.

Metal Temperature—The temperature of the metal on a gas pot should never go higher than 550°, and it may give better results a trifle below that. The electric pot usually gives better results when operated at a temperature between 535 and 550°.

Ejection of Slugs

If a slug does not eject properly from the mold see if the ejector is set to correspond to the length of the slug being cast. Also see if the trimming knives are set correctly for the body of the slug. Do not try to force the slug from the mold until these two items have been checked.

To inspect the mold when a slug refuses to eject, push in on starting lever and turn the cam shaft backward by pressing down on the first elevator cam as far as it will go, which will release the pressure against the ejector lever pawl. Then pull back on the ejector lever handle and continue to turn the cam shaft backward until the mold disk is free from the locking studs which will allow the mold disk to turn.

If the trimming knives are set to a smaller size than the body of the slug, turn the machine backward by the same procedure as before mentioned, so that the slug will not press against the knives and they will be free to open.

If a slug hesitates when it is being ejected, this may be caused by mold liners with rough ends, the mold may have an accumulation of metal on its sides, the trimming knives set so as to dig into the sides of the slug, the trimming knives dull or nicked, the driving clutch leathers lifeless, worn or gummy, or the inside rim of the driving pulley may be slippery. A hollow slug, porous enough to allow the ejector blades to penetrate it, will either hesitate at the ejection point or not eject at all.

To Remove Ejector Slide—If it becomes necessary to remove the ejector slide from the machine, the vise must be opened to the second position. Turn the machine until the first elevator slide head rests on the vise cap and shut off power before the mold slide advances; then open the vise to the first position and withdraw the pin against which the bottom lug on the vise rests, lowering the vise carefully. Before the mold slide can be drawn all the way out, the ejector blade controller *3* (shown on page 33) must be released by removing the controller link rod *18*, which has a slot for a screwdriver at its end and must be loosened from the link lift *20* to allow the blade controller to drop out. This must be done with the mold slide in normal position. If the machine has a water-cooled mold disk, the hoses must be disconnected. The mold slide can now be withdrawn from the machine after it has been disconnected in the usual manner.

Replacing Damaged Ejector Blades—If a damaged ejector blade is to be replaced, remove the ejector slide keeper *17* which is fastened with a screw at each end, and also the ejector slide *4*.

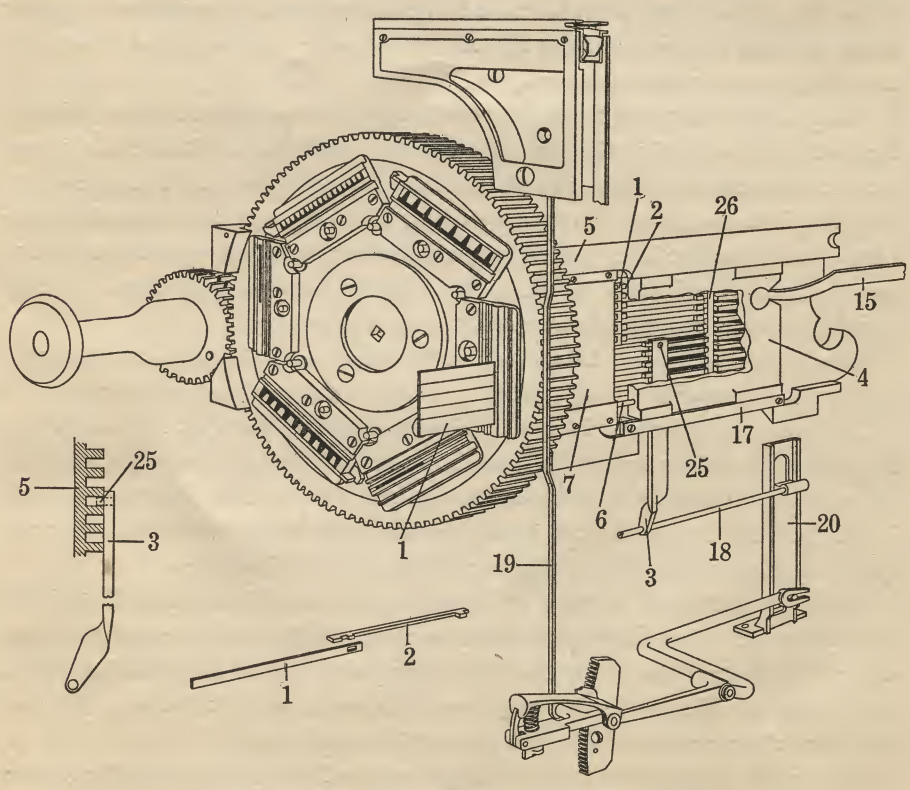
The ejector blade guide *7* is held in place with three screws at the top and three at the bottom. The front screws are directly under the rim of the mold

disk, but there is sufficient room to take them out without removing the mold disk from the mold slide.

The ejector blade *1* is fastened on the ejector blade link *2*, and it is necessary to have them fit snugly when they are connected. The blades must be of equal length, and the front ends must be square and have the full thickness (no rounded edges). If the end of the ejector blade is thin it might sink into the back of the slug when ejection is taking place, and cause the slug to stick in the mold.

The ejector blade link stop *26* is made of steel and its outer projections are tapered to guide the blade controller pin *25* into the slots when the ejector blades are moved forward, and if the taper on the projections becomes too badly worn, the link stop should be replaced.

When reassembling the ejector blades, every part, including the slots in the mold slide, should be thoroughly cleaned, so that when the ejector blade guide *7* is fastened in place, the ejector blades will slide freely when the



View in detail of the mechanism of the universal ejector blade with the 24½-em six-mold disk. The mechanism is exactly the same when used with the four-mold or the 30-em six-mold disks.

screws are tightened. Also connect the ejector slide *4* and the keeper *17*. After the mold slide is replaced in the machine, connect the blade controller. To get the mold slide in position to do this, note first that the lower edge of the mold slide near the rear end has been cut out about ½" in length and $\frac{3}{16}$" deep, and to get the controller in the correct position to be raised, have it directly opposite the cut in the mold slide, with the pin *25* toward the left side of the machine, and have the ejector slide nearly all the way back which will bring the ejector blade links in a position where they will clear the controller when it is raised. Fasten controller in place with the rod *18*.

Adjusting Stroke of Ejector Lever—The illustration on page 35 shows the operation of the ejector lever. *12* is the ejector lever adjustable pawl, which is held in position by the adjusting screw *27*. When the slug is to be ejected the ejector cam *16* comes in contact with the pawl *12*. The travel of the ejector lever is controlled by the adjusting screw *27*. If the ejector blade does not come far enough ahead, turn out on the adjusting screw *27* which will allow the ejector lever pawl to come lower and remain in engagement longer when the slug is ejected. If the ejector blade comes too far ahead, lower the adjusting screw to raise the pawl.

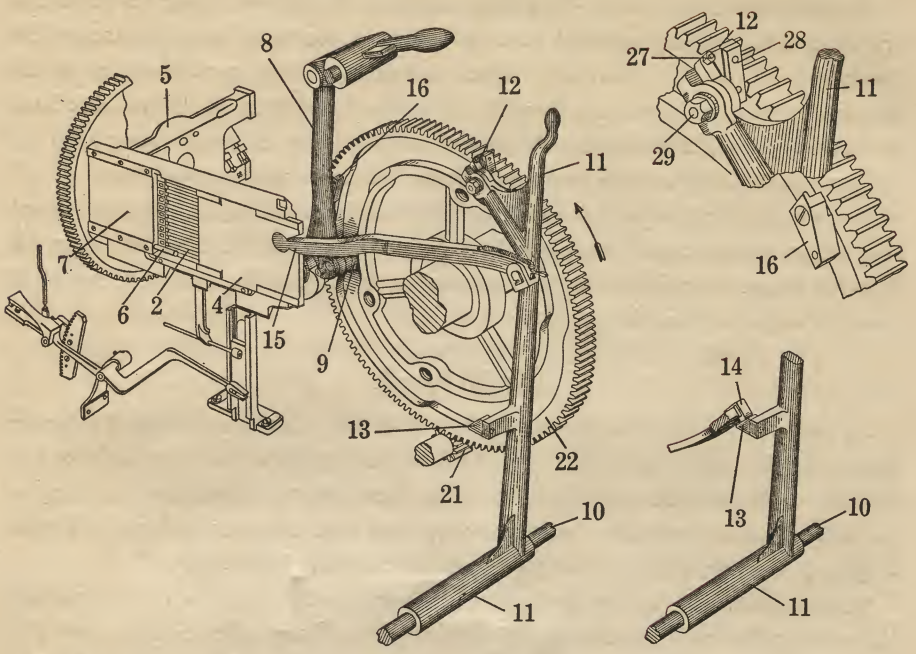
On the forward travel the ejector blade should be adjusted to come slightly beyond the front end of the lower liner in the knife block. If the blade comes too far forward, the slug may strike the slug adjuster, and hesitate when dropping into the galley. On the lower part of the ejector lever there is a shoe *13* which returns the lever to normal position. In case the shoe should be lost or become loose, the blades would not be fully withdrawn from the mold and they might be damaged when the disk started to revolve.

Removing the Ejector Lever Adjustable Pawl—If it becomes necessary to remove the ejector lever adjustable pawl, there are two ways of doing it.

The first way is to turn the machine backward until the ejector lever *11* can be pushed ahead far enough to bring the head of the pawl screw *29* opposite the opening in the side of the main driving gear (where the roll *9* travels) and in this position the screw can be loosened all the way; then disconnect the spring which is fastened to the bottom of the pawl with a screw.

A second and easy method of removing the pawl is to place flatwise a hammer handle that will just fit between the main driving gear and the front end of the ejector lever near the pawl, then twist the handle sidewise, which will move the ejector lever away from the main gear far enough to give sufficient clearance to remove the screw *29* from the pawl.

If the pawl plate *28* shows wear at its lower end, replace it so it will give the proper travel to the ejector lever. The pawl spring should be connected before the pawl is replaced.



View showing the ejector lever and the cam which operates it, together with the large gear 22 meshing with the pinion 21 on the jack shaft. This gearing causes the rotation of the cam shaft.

Failure of Slugs to Eject—Sometimes a slug will fail to eject, and it may be that the slug is hollow, or the trimming knives may be set wrong; for instance, if the knives are set to trim an 8-point slug and a 10-point slug is cast it would be impossible for the ejector to push it through until after the machine is backed up and the knives readjusted. To do this, push the starting lever in and turn the machine backward as far as possible by pressing against the first elevator cam, and when it comes to a stop, pull back on the ejector lever *11* and continue to turn backward until the slug is far enough away to allow the knife to spring into place when the proper setting is made.

Examine the knife wiper bar rod to see that it does not bind, and that the return spring is of sufficient strength to raise the rod to its full height. If the rod is not fully raised, it will leave the wiper in front of the slug being ejected, and cause it to stick.

An ejector blade not set the full length of the slug to be cast will interfere with proper ejection. Another cause of slugs sticking in the mold is rough mold liners. To remedy this, rub the ends of the liners with a fine oilstone, being careful not to change their taper.

Removing a Stuck Slug—If a slug sticks in the mold it may be bound at one end only, and to examine it, turn the machine back in the manner just described. When the mold disk clears the stud blocks, turn the disk to the left and loosen the right-hand mold cap screw; then turn the mold disk back to ejecting position and if the slug is not hollow it can be pushed out with the ejector blade. Tighten the mold cap screw before casting another line.

If the slug is hollow and does not eject when the mold cap screw is loosened, turn the machine backward and lift the ejector pawl *12* to clear the cam *16;* then allow the machine to turn to normal position, and loosen the three mold cap screws to free the slug.

Knife Block

As the slugs pass through the knife block the sides are trimmed to make them parallel and the correct size. The left-hand knife must be adjusted to trim any overhanging portion of the type face without trimming the body of the slug. The knives must be kept sharp and free of nicks. In order to trim slugs parallel there can be no lost motion in the slide bearings.

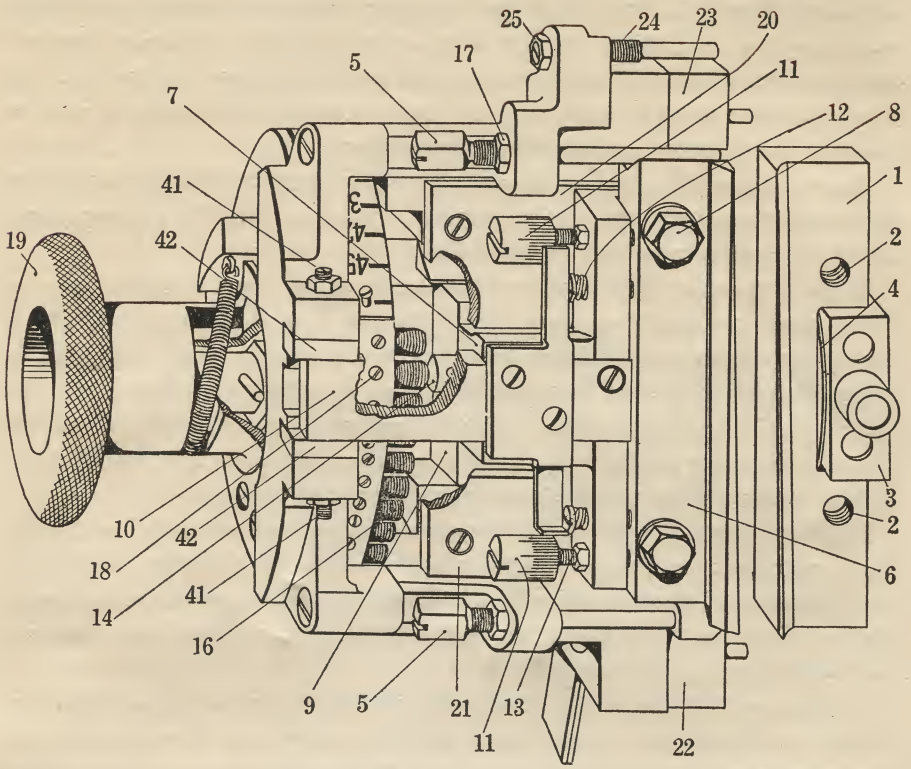
The maintenance of the knife block is principally a matter of adjustment, rather than the replacement of the various parts. (See illustration on page 37.)

The left-hand knife rests against the adjusting screws *5* and is held in place with two square-headed screws passing through the vise frame. It is possible for this knife to be forced away from the adjusting screws if it should be subjected to some undue strain, as there is no support on its left-hand side. If that should occur, it is only necessary to loosen the two square-headed screws in the knife and the spring *4* will bring the knife back to its original position.

Adjusting the Knives—If the left-hand knife is to be adjusted to trim the slug closer to the edge, loosen the lock nuts *17*, and turn the adjusting screws *5* out slightly before loosening the square-headed screws in the knife.

The right-hand knife is fastened to the movable slide *9* with two hexagon-head screws *8*. Before adjusting this knife, examine the slide *9* and determine if there is any lost motion. If so, it will be difficult to keep the knives parallel when different length slugs are set. To make the adjustment, two screws located on top of the knife block casting reach to a gib placed over the top of the slide, and as the screws are turned down, the gib presses on the top of the slide to eliminate excessive play.

A simple way to make this adjustment is to first turn the knife block so that the scale registers 5 point, then loosen the lock nut on one of the adjusting screws, and turn the screw down tight against the gib, which will lock the knife slide at 5 point. Open the knife block all the way until the dial registers 45 point, which will leave a space between the setting screw button, and the



View showing rear of knife block.

setting screw. Then with a screwdriver, loosen the adjusting screw very slowly until the slide snaps over against the setting screw. Hold the screw steady and tighten lock nut. Adjust the other screw in the same manner.

After this adjustment has been made, the support gib screws *41* should be adjusted to bring the support gibs *42* just to bear against the slide bracket support *10* to take up the play, but not so tight as to interfere with the adjustment described above.

This additional support adjustment at the right-hand end of the slide *9* is on all late model knife blocks. The adjusting screws are moved just enough to support the end of the slide but must not be tight against it. This adjustment must be made after the first one is completed.

If the slide should become gummy and not slide freely in the guide, a small amount of kerosene applied on the bearing surface will cut the gum and also act as a lubricant.

When adjusting the right-hand knife for parallel, use slugs of the maximum width-capacity of the machine, then loosen the lock nuts on the micrometer

adjusting screws *11*, and when the adjusting screws are moved, the marks will show how much the knife will change when the knife clamping screws *8* are loosened. When the knife has been set parallel, tighten the lock nuts on the adjusting screws to hold them in place. A micrometer must be used to measure the slugs to determine the exact setting.

Each of the setting screws, as shown at *16*, is independently adjustable so that slugs of any point size can be trimmed "close" or "full." This is sometimes desirable for spacing effects between lines.

If the slug measures the same at both ends, check the ribs at the center of the slug and see that they correspond with the measurement at the ends. If the center ribs measure thinner than the ends, the right-hand knife may be warped, and if so, it may be necessary to use an oilstone on the edge of the knife to make the slug parallel. It is very important that the ribs on the slug measure the same all the way across, otherwise when a change is made from wide to narrow measure, the short slug might not be parallel.

When setting the knives use lower case matrices in the "test" line. Capital letter matrices have a slight overhang, and when the slug is trimmed, there is more metal to remove, resulting in more pressure on the knives and a possible slight variation in the setting. This will be particularly noticeable on machines that have been in use for some time.

If slugs are "off their feet," (the bottom thinner than the top of the slug) it may be caused by the left-hand knife not trimming close enough and leaving an overhang at the top of the slug. This condition may also be caused by dull knives, worn or loose mold locking studs, or worn stud blocks.

To insure a slug trimming parallel there must be no lost motion in the mold locking studs or stud blocks. To test this, leave the vise closed and turn the machine backward until the mold disk is fully advanced and the locking studs are in place, then pull ahead on the handle of the mold disk pinion and rock it from side to side to see if there is any lost motion in the mold disk. If there is any looseness, the locking studs or stud blocks are worn.

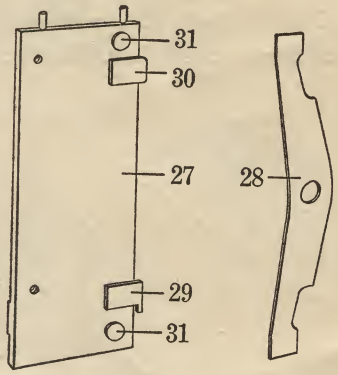
The knife block is fastened to the vise frame with two hexagon head screws. Before removing the knife block from the machine, it is important to see that the lock nuts are tight on the left-hand knife adjusting screws.

If the screws are not locked in place they might move, and when the knife block is fastened in place the set screws might force the left-hand knife out of place. Also see that the surfaces of the liners *22* and *23* are perfectly clean, so that when the knife block is fastened in place the knives remain parallel.

If the knife block is removed from the machine for repairs, test the knives for parallel after it has again been fastened in place on the machine.

Referring to the illustration on page 39, *27* shows the right-hand side spring

plate on which are riveted two lugs, *29* and *30*. The lower lug *29* has a small projection extending from its lower side; on the inside at the lower end of the right-hand knife there is a slot with a pin across, and the projection on the lower lug fits over the pin in the knife to keep the spring plate in position. *28* shows the spring that forces the spring plate to the left; *31* shows the two studs with undercut heads.



Showing details of the spring plate 27; 28 is the spring plate spring, and 29 and 30 show the lower and upper lugs on the spring plate. 31 shows the two studs with undercut heads.

On the later model machines the spring plate is fastened to the slug plate with two screws. The movement of the slug plate is thereby limited in constant relation to the right-hand knife. The purpose of this is to eliminate the possibility of damage to overhanging characters on slugs, and maintain the spring pressure on regular slugs. The movement of this side spring plate is limited by the screws to .005".

When the knife block is being assembled, place the projection of the lower lug *29* over the pin in the side of the right-hand knife. It will be noticed that spring plate spring *28* has the side cut away at each end. The ends of the spring fit under the cutout heads of the studs *31* and below that point the spring is cut away enough to clear the spring plate lugs when the spring plate is pressed down.

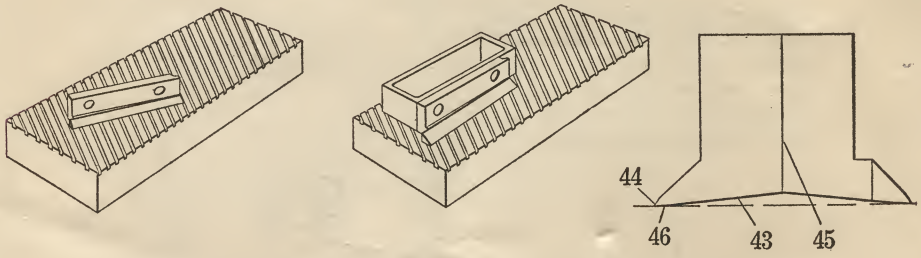
The right-hand vise jaw adjusting screw *24*, shown in the illustration on page 37, controls the position of the type on the face of the slug so that it will have neither an indention nor overhang.

When an adjustment is made with this screw, see that it does not affect the adjustment of the pot pump safety stop.

Sharpening the Trimming Knives—If the side trimming knives are very dull, or the edges nicked, they should be returned to the Linotype Company to be ground. Send both knives, as they are ground in pairs to make sure they will always be of equal height.

If only the edges of the knives are dull, they may be dressed with a lapping block and an oilstone. A lapping block suitable for this purpose can be obtained from the Linotype Company, listed in the Linotype Catalogue as F-317, together with a knife support block F-701, and No. 120 powdered emery, X-491, also to be used in lapping the knives.

For best results, proceed in the following manner: Sprinkle the surface of the lapping block with the powdered emery and moisten with kerosene. Hold the face *43* of the knife flat on the lapping block and rub, as shown to the left in the illustration just below. The face *45* should then be held firmly against



Showing correct procedure in sharpening the trimming knives. The view to the right illustrates how the knives are tapered for proper trimming and smooth ejection of the slug.

the knife support block and the cutting edge *46* rubbed over the lapping block, as shown in the middle view, being careful that this edge is not ground back farther than $\frac{1}{64}$". Then dress the edge *44* with a fine oilstone.

The taper allows the slug to be ejected with the least possible resistance, and the original angles of the knives must always be preserved to prevent them from digging into the slug when trimming.

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